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(71) Applicant: KATZ, Michael [CA/CA]; 105 West 18th Avenue, Vancouver, British Columbia V5Y 2A6 (CA).

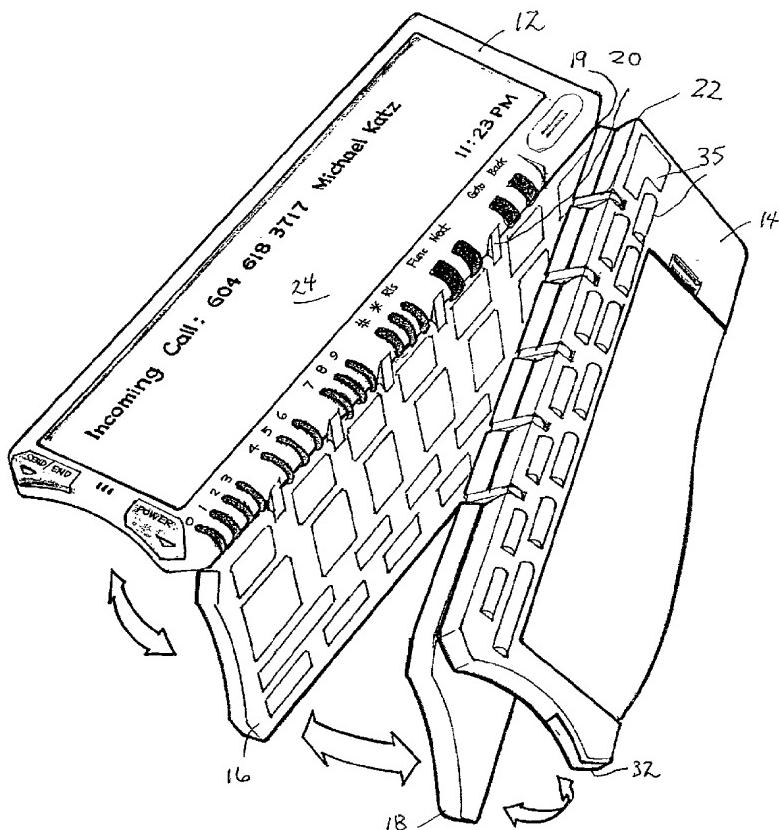
(74) Agent: GREEN, Bruce, M.; Oyen Wiggs Green & Mutala, #480 - 601 West Cordova Street, Vancouver, British Columbia V6B 1G1 (CA).

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[Continued on next page]

(54) Title: FOLDING CELLULAR TELEPHONE AND DIGITAL ASSISTANT WITH IMPROVED KEYBOARD



(57) Abstract: Prior combination mobile telephones/personal digital assistants have reduced-size keyboards which are not useful for standard typing. The present invention provides a folding combination mobile telephone/personal digital assistant/computer, comprising a screen, a central processing unit, data storage and input means and a usefully sized computer keyboard. It does this by having the keyboard divided into two halves hingedly connected along a fold line. At least one of the keys may be split along the fold line to permit folding of the keyboard.

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**FOLDING CELLULAR TELEPHONE AND DIGITAL  
ASSISTANT WITH IMPROVED KEYBOARD**

**Technical Field**

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The invention relates to mobile telecommunications devices, and in particular to a combination cellular telephone and portable digital assistant with an improved keyboard.

**10    Background Art**

Various devices are known which combine the functions of a mobile telephone and a computer or personal digital assistant. See for example US patents 5,719,936; 5,526,411 and 5,189,632. However in those devices where the size of the device is comparable to a standard cellular telephone, the computer keyboard is not a standard size and therefore is less useful for a typist.

There is therefore a need for a combination mobile telephone and computer which has the size of a standard cellular telephone as well as a computer keyboard which is useful for typists.

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**Disclosure of Invention**

The present invention provides a folding combination mobile telephone/computer which is sized as a cellular telephone when fully folded yet when fully opened provides a screen, a central processing unit, and a usefully-sized computer keyboard. It does this by having the keyboard divided into two halves hingedly connected along a fold line, to which the telephone and computer sections are hingedly connected.

**20    Brief Description of Drawings**

In drawings which disclose a preferred embodiment of the invention:

Fig. 1 is a perspective view of the invention, fully folded;  
Fig. 2A is a perspective view of the invention, partially open;  
Fig. 2B is a perspective view of the invention, fully open;  
Fig. 3 is an elevation view of the invention, half open;  
Fig. 4 is an elevation view of the invention, fully open;  
Fig. 5 is a detail in section of the keyboard keys; and

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- 2 -

Fig. 6 is a detail in section of a second embodiment of the keyboard keys.

Best Mode(s) For Carrying Out the Invention

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With reference to the drawings, a combination mobile telephone and computer is designated generally as 10. It comprises a screen section 12, computer and battery section 14, and keyboard halves 16, 18. The device is hinged at hinges 20, 22, and at hinges 47 along joint 19 between sections 16, 18 so that the keyboard halves 16, 10 18 can first be folded behind screen section 12 and computer section 14, as shown in Fig. 2A, and then folded again to be sandwiched between the screen section 12 and computer section 14 as shown in Fig. 1.

When fully folded as shown in Fig. 1, the device operates as a cellular telephone and personal digital assistant. Screen section 12 is on the exterior and 15 controls the function of the cellular telephone. It has a touch display screen 24, numeric telephone dialing buttons 26, power switch 23, send/end button 25, earpiece speaker 28 and microphone 30. It also has the function buttons 21 for operating a personal digital assistant ("PDA") so that it can function as a PDA in the folded position using touch screen 24. The antenna 32 for the telephone is contained in 20 computer section 14 and can be extended as shown in Fig. 1 or retracted as shown in Fig. 2A. The battery for the telephone is contained in section 14. Electrical connections are made between each section through hinges 47, 20 and 22. To unfold the telephone to place it into computer with keyboard mode, the two keyboard halves 16, 18 are unfolded and the screen and battery sections 12, 14 are unfolded.

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When fully unfolded as shown in Fig. 2B and 4 the device functions as a personal digital assistant or computer, and can also function as a cellular telephone, for example sending data by modem, and dialing from screen 24 and using speaker-phone 53. Screen 24 functions as the computer screen and keyboard 32, composed of keyboard halves 16, 18 acts as the computer input. The back of section 14 contains 30 some of the computer function keys 35 also. At least one of the keys 37 may be split along the fold line to permit folding of the keyboard as disclosed in the same inventor's US patent no. 6088220. Keyboard 32 has three rows 34, 36, 38 of letter keys. The letters are spaced at the normal spacing of a standard QWERTY keyboard, 19 mm measured center to center both horizontally and vertically (referring to the "up" 35 direction in FIG. 3 as "vertical" and the "sideways" direction as "horizontal"). The center row 36 of the letter keys (ASDFGHJKL;) are standard size keys. The top row

- 3 -

- 34 (QWERTYUIOP[]) and bottom row 38 (ZXCVBNM,./) are cut in half horizontally so that they are only 50% of the vertical size. However, so that a typist can utilize the same finger action to that employed on a standard full-size QWERTY keyboard, the top row of keys 34 have a scalloped edge 40 along their upper edges and the bottom rows of keys 38 have a scalloped edge 42 along their lower edges. Thus, when a typist types on this keyboard he/she will use the same finger action as for a standard keyboard, but to prevent the typist from missing the upper and lower keys, the key caps of the top and bottom rows are shaped to prevent the fingers from overrunning the keys by curving the upper or lower edges of the keys in the top and bottom rows upwardly.
- 5      The spacebar 46 is 50% of the width of a standard spacebar. When folded the tops of edges 40, 42 are pressed down to be even with the tops of the other keys. Another embodiment is shown in Fig. 5 in dotted outline, whereby the top surface 49 of the top and bottom rows slopes uniformly upwardly rather than having a curved upper surface. A further embodiment is shown in Fig. 6, whereby the top surface 51 of the top and
- 10     15     bottom rows 34, 38 is raised above center row 36 but is horizontal or flat on the upper surface 51 of the key.

The approximate preferred dimensions for this device are as follows: fully folded dimensions: length 5-1/2 inches, width 1-7/8 inches, thickness 7/8 inches. Screen 24 is 5-1/4 inches by 1-1/4 inches. The unfolded length is approximately 11 inches.

20     25     As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

- 4 -

WHAT IS CLAIMED IS:

1. A folding combination mobile telephone, personal digital assistant and computer, comprising a display screen section having telephone control keys, a central processing unit section, battery and antenna means, and two data input means sections, said data input means comprising a computer keyboard comprising a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, and comprising two halves hingedly connected along a fold line extending transversely across said keyboard, each half thereby comprising a portion of said plurality of keys, whereby said computer is folded from a first open position in which said plurality of keys forms said generally standard personal computer keyboard, to a closed position in which said two halves are in opposed parallel relationship whereby said respective portions of said plurality of keys on said respective halves face each other in close proximity or actual contact; and wherein said screen and central processing unit sections are hingedly connected to respective ones of said keyboard sections, and wherein when in fully folded configuration said combination functions as a cellular telephone and personal digital assistant in fully open position said combination functions as a computer, mobile telephone and personal digital assistant.
2. The folding computer of claim 1 wherein at least one of said keys is split along said fold line to permit folding of said keyboard.
3. The folding computer of claim 1 wherein said computer keyboard comprises a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upstanding edges along the top and bottom edges thereof respectively which are raised above said central row.
4. The folding computer of claim 1 wherein said computer keyboard comprises a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upstanding edges along the top and bottom edges thereof respectively which are raised above said central row.

- 5 -

bottom edges thereof respectively which are raised above said central row, and a uniformly sloping upper surface.

5. The folding computer of claim 1 wherein said computer keyboard comprises a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upper surfaces which are raised above said central row.
10. 6. A computer keyboard, comprising a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upstanding edges along the top and bottom edges thereof respectively which are raised above said central row.
15. 7. A computer keyboard, comprising a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upstanding edges along the top and bottom edges thereof respectively which are raised above said central row, and a uniformly sloping upper surface.
20. 8. A computer keyboard, comprising a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upper surfaces which are raised above said central row.
25. 8. A computer keyboard, comprising a plurality of keys generally corresponding to the keys of a standard personal computer keyboard, arranged in at least three longitudinal rows, wherein the keys in the central row are of a standard size, and the keys in the top and bottom row are of reduced size, and have upper surfaces which are raised above said central row.

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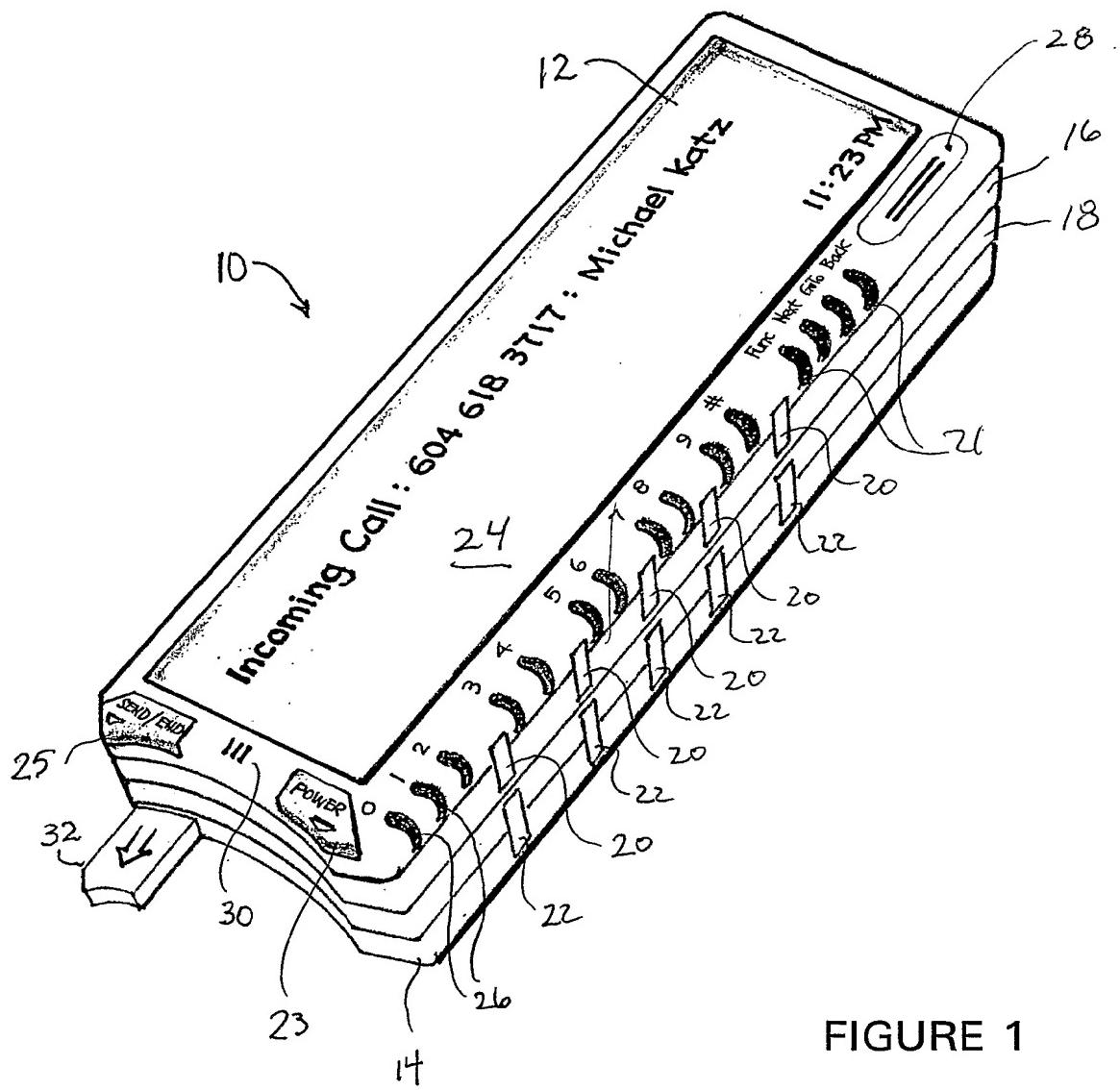


FIGURE 1

2/6

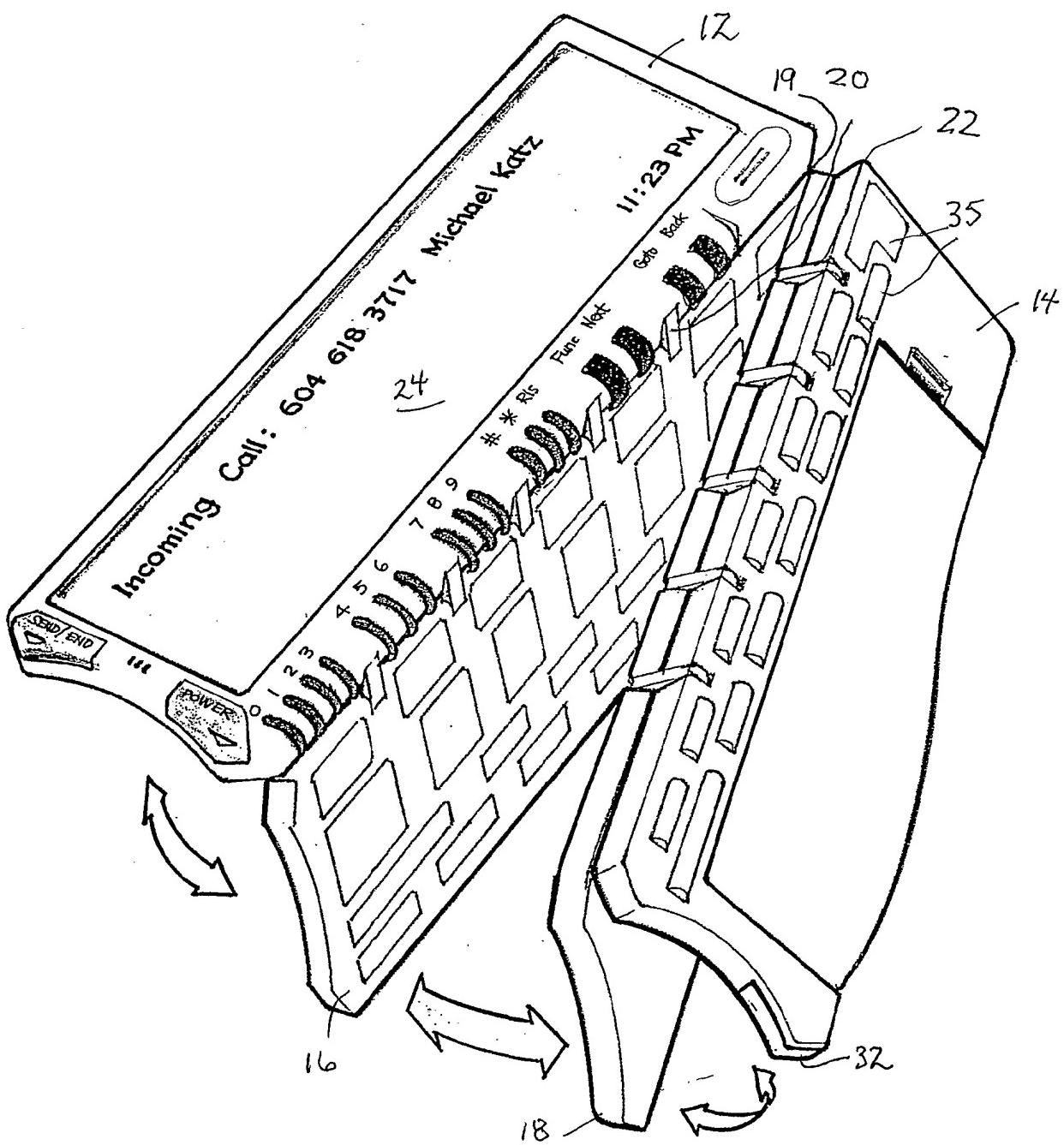


FIGURE 2A

3/6

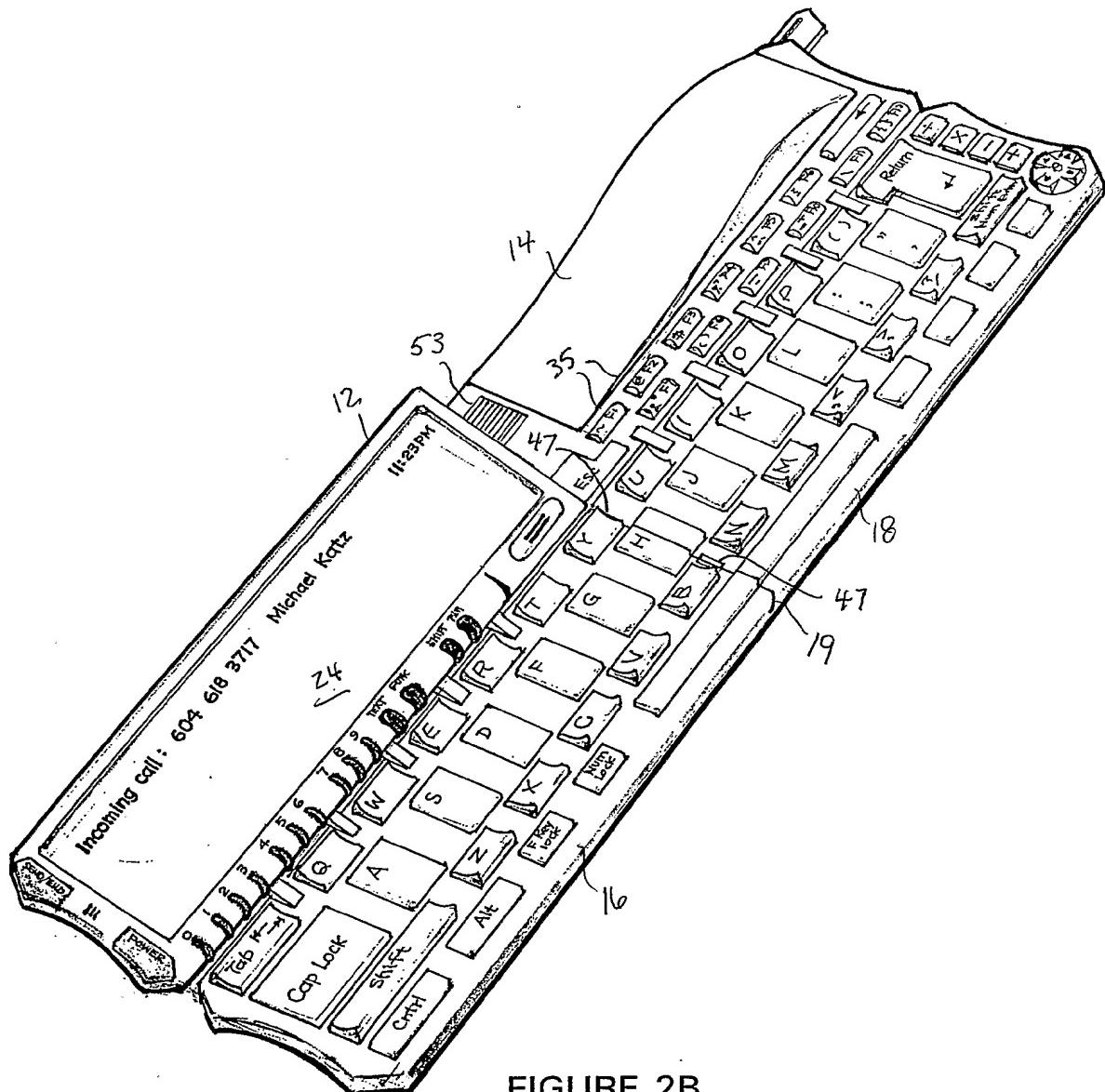


FIGURE 2B

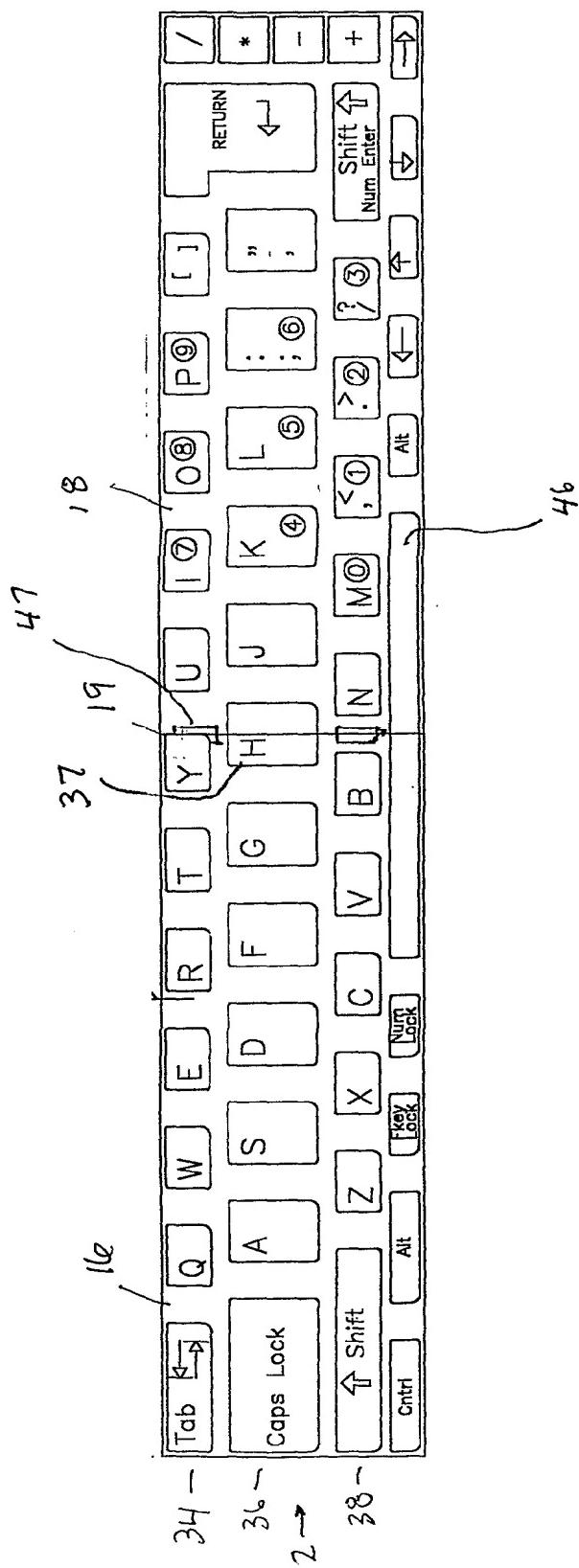


FIGURE 3

5/6

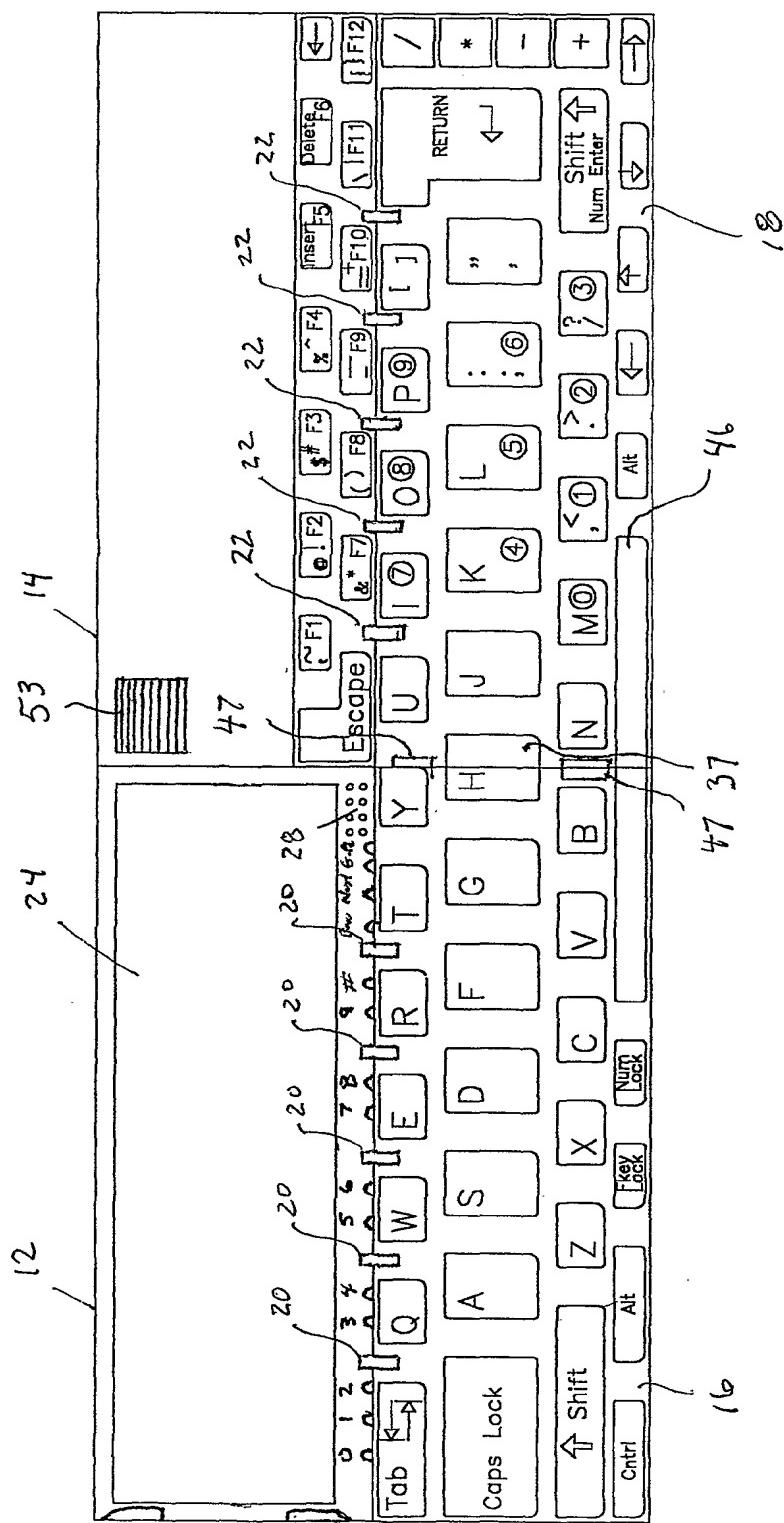


FIGURE 4

6/6

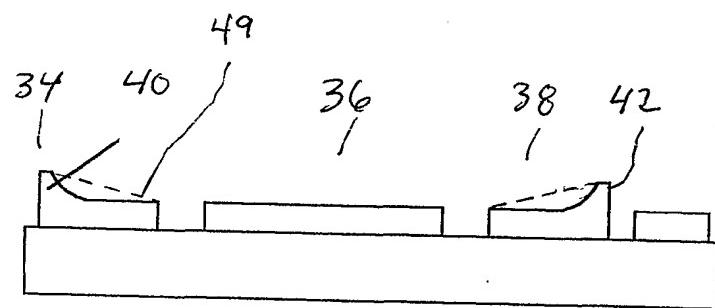


FIGURE 5

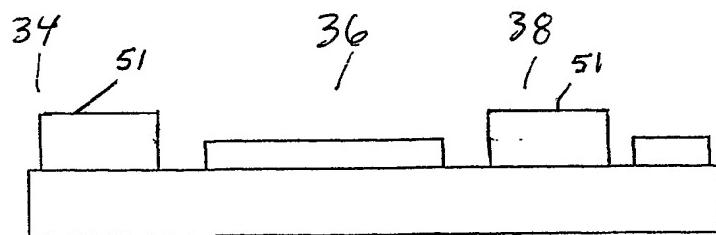


FIGURE 6

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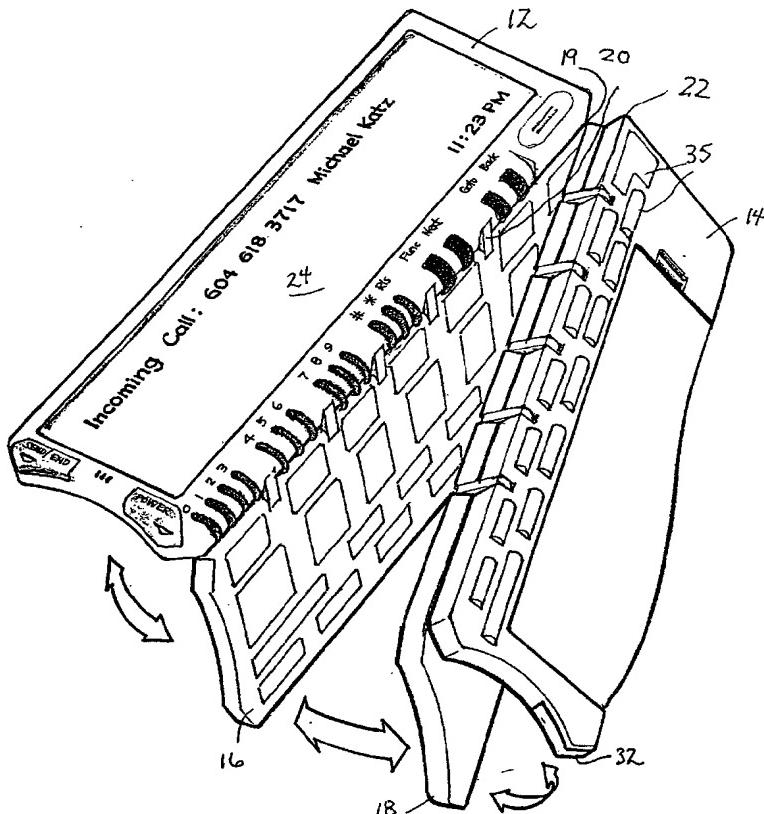
(84) **Designated States** (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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[Continued on next page]

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# INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 G06F1/16 H04M1/725 H04M1/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 G06F B41J H01H H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 19226 A (THEREFORE LTD.) 7 May 1998 (1998-05-07)	1
Y	page 6, line 22 -page 7, line 16; figures 1-3,6 ---	2
Y	US 6 088 220 A (KATZ) 11 July 2000 (2000-07-11)	2
A	column 3, line 25 -column 4, line 3; figures 3,4,11-13 ---	1,3-8
A	US 5 251 163 A (ROUHANI) 5 October 1993 (1993-10-05) column 5, line 25 - line 46; figure 10 ---	6,7
A	EP 0 933 908 A (NOKIA MOBILE PHONES LTD.) 4 August 1999 (1999-08-04) column 2, line 25 - line 41; figures 1,2 ---	1 -/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Taylor, P

**INTERNATIONAL SEARCH REPORT**

International Application No

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**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 483 418 A (HOSOI) 9 January 1996 (1996-01-09) figures 10,11 -----	7

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

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